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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/801,350	03/07/2001	Chun Hsiang Lai	JCLA6643	4896

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EXAMINER
NADAV, ORI

ART UNIT	PAPER NUMBER
2811	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/801,350	LAI ET AL.	
	Examiner	Art Unit	
	Ori Nadav	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,13 and 15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,13 and 15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4, 13 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claimed limitation of a second diode, as recited in claim 1, is unclear as to which diode is the first diode.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 13 and 15, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Quigley (5,781,388) in view of Lin (5,982,601) and Ker et al. (5,754,380).

Regarding claims 1 and 13, Quigley teaches in figure 1 an electrostatic discharge (ESD) protection circuit, suitable for use on the I/0 pad, the ESD protection circuit comprising: a silicon controlled rectifier (SCR) circuit 22, which comprises a first connection

terminal, a second connection terminal, and a third connection terminal, wherein the first connection terminal and the second connection terminal are respectively connected to the I/O pad and a ground voltage Vss, so as to discharge the electrostatic charges; and

an anti-latch-up circuit RC 17, 18, which comprises a fourth connection terminal directly connected to a voltage source (the pad line), a fifth connection terminal coupled to the ground voltage Vss, and a sixth connection terminal 21 connected to the third connection terminal of the SCR circuit, wherein a voltage rising rate at a node of the anti-latch-up circuit determines whether or not to trigger the SCR circuit for preventing latching up of the SCR circuit during normal operation.

Although Quigley does not state a voltage source, this feature is inherent in Quigley's device as the line connected to the pad is the voltage source to the device. Furthermore, capacitor C also provides a voltage source to the device. Note that the device would not function without a voltage source.

Quigley does not explicitly state that the voltage rising rate at a node of the anti-latch-up circuit determines whether or not to trigger the SCR circuit, and wherein the fourth connection terminal is directly connected to a voltage source, and does not teach a second diode, having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal.

Lin teaches in figures 6, 9 and 10 and related text a voltage rising rate at a node of the anti-latch-up circuit determines whether or not to trigger the SCR circuit for preventing latching up of the SCR circuit during normal operation, wherein the fourth connection terminal is directly connected to a voltage source.

Ker et al. teach in figure 1 a second diode 60, having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a voltage rising rate at a node of the anti-latch-up circuit determines whether or not to trigger the SCR circuit for preventing latching up of the SCR circuit during normal operation and to directly connect the fourth connection terminal to a voltage source, and to use a second diode having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal, in Quigley's device, in order to improve the protection capabilities of the device, and in order to simplify the construction of the device, respectively.

Regarding claim 2, Ker et al. teach in figure 1 a first diode 70, having a first input end and a second input end, respectively connected to the ground voltage and the I/O pad.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a first diode, having a first input end and a second input end, respectively connected to the ground voltage and the I/O pad in prior art's device in order to provide better protection for the device against ESD event.

Regarding claims 3 and 4, Lin teaches in figure 5 an SCR circuit comprises: a P-type substrate; an N well, formed in the p-type substrate; a first P+ doped region, formed in the P-type substrate and coupled to the ground voltage GND; a first N+ doped region, formed in the P-type substrate, adjacent to the first P+ doped region, and coupled to the

ground voltage GND; a second N+ doped region, formed between the P-type substrate and the N well, adjacent to the first N+ doped region, and coupled via the third connection terminal of SCR circuit to the sixth connection terminal of the anti-latch-up circuit A, serving as a guard ring to collect electrons to avoid latch up when the anti-latch-up circuit sends signal through the sixth connection terminal to the third connection terminal of the SCR circuit during normal operation, and floating when the anti-latch-up circuit sends no signal to the SCR circuit during an ESD event;
a second P+ doped region, formed in the N well, adjacent to the second N+ doped region, and coupled to the I/0 pad 1; and a third N+ doped region, formed in the N well, adjacent to the second P+ doped region, and coupled to the voltage source (the pad line),

wherein Lin teaches in figure 6C an anti-latch-up circuit comprises: a capacitor C, having a first contact end and a second contact end, respectively coupled to the second N+ doped region and the ground voltage, and a resistor R, having a first end and a second end, respectively coupled to the voltage source and the second N+ doped region.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form prior art's device as taught by Lin, in order to improve the protection capabilities of the device.

Regarding claim 15, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a RC delay time of the anti-latch-up circuit is

smaller than a voltage rising time of an IC power but greater than a voltage rising time of an ESD pulse in prior art's device in order to improve the protection capabilities of the device.

Claims 1-4, 13 and 15, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (5,982,601) in view of Ker et al. (5,754,380).

Lin teaches in figures 6 and 9 and related text an electrostatic discharge (ESD) protection circuit, comprising: a silicon controlled rectifier (SCR) circuit (see figure 6 for clarity), which comprises a first connection terminal, a second connection terminal, and a third connection terminal, wherein the first connection terminal and the second connection terminal are respectively connected to the I/O pad (Anode) and a ground voltage (Cathode), so as to discharge the electrostatic charges; and

an anti-latch-up circuit 61, which comprises a fourth connection terminal directly connected to a voltage source VH (see figure 6A), a fifth connection terminal coupled to the ground voltage VL, and a sixth connection terminal A connected to the third connection terminal of the SCR circuit, wherein a voltage rising rate at a node of the anti-latch-up circuit determines whether or not to trigger the SCR circuit for preventing latching up of the SCR circuit during normal operation.

Lin does not teach e a second diode, having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal.

Ker et al. teach in figure 1 a second diode 60, having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a second diode having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal, in prior art's device, in order to improve the protection capabilities of the device.

Regarding claim 2, Ker et al. teach in figure 1 a first diode 70, having a first input end and a second input end, respectively connected to the ground voltage and the I/O pad. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a first diode, having a first input end and a second input end, respectively connected to the ground voltage and the I/O pad in prior art's device in order to provide better protection for the device against ESD event.

Regarding claim 3, Lin teaches in figure 5 an SCR circuit comprises: a P-type substrate; an N well, formed in the p-type substrate; a first P+ doped region, formed in the P-type substrate and coupled to the ground voltage GND; a first N+ doped region, formed in the P-type substrate, adjacent to the first P+ doped region, and coupled to the ground voltage GND; a second N+ doped region, formed between the P-type substrate and the N well, adjacent to the first N+ doped region, and coupled via the third connection terminal of SCR circuit to the sixth connection terminal of the anti-latch-up circuit A, serving as a guard ring to collect electrons to avoid latch up when the anti-latch-up circuit sends signal through the sixth connection terminal to the third connection

terminal of the SCR circuit during normal operation, and floating when the anti-latch-up circuit sends no signal to the SCR circuit during an ESD event;

a second P+ doped region, formed in the N well, adjacent to the second N+ doped region, and coupled to the I/0 pad 1; and a third N+ doped region, formed in the N well, adjacent to the second P+ doped region, and coupled to the voltage source (the pad line).

Regarding claims 4 and 13, Lin teaches in figure 6C an anti-latch-up circuit comprises: a capacitor C, having a first contact end and a second contact end, respectively coupled to the second N+ doped region and the ground voltage, and a resistor R, having a first end and a second end, respectively coupled to the voltage source and the second N+ doped region, wherein the anti-latch-up signal sent from the sixth connection terminal to the SCR circuit comprises a voltage signal.

Regarding claim 15, prior art teaches substantially the entire claimed structure, as applied to claim 1 above, including a RC delay time of the anti-latch-up circuit being greater than a voltage rising time of an ESD pulse. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a RC delay time of the anti-latch-up circuit being smaller than a voltage rising time of an IC power in prior art's device in order to operate the device in its intended use.

Response to Arguments

Applicant argues that "the diode 60 of Ker is connected in parallel with the PTLSCR device 30, but the second diode 108 of the present invention is connected between the SCR circuit 104 and the anti-latch-up circuit 110. In other words, the connection relationship and operation between the diode 60 of Ker and the second diode 108 of the present invention are different". Applicant further argues that "Quigle, Lin and Ker fail to disclose and teach the I/O pad coupled to the anti-latch-up circuit through the second diode".

The second diode of Ker meets the claimed limitation of the second diode of the present invention, because the second diode 60 of Ker is connected between Vdd terminal and the output pad wherein the second diode of the present invention is also connected between Vcc terminal and the output pad. Note that claim 1 merely requires that a second diode having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal (which is the Vdd).

Regarding applicant's argument that "Quigle, Lin and Ker fail to disclose and teach the I/O pad coupled to the anti-latch-up circuit through the second diode", these features are not recited in the claim. Note that a claimed limitation of "a second diode, having a first input end coupled to the I/O pad and a second input end coupled to the fourth connection terminal, merely means that there must be electrical connection between the second diode, the I/O pad and the fourth connection terminal. There is no requirement that the second diode must have a first input end directly connected to the I/O pad and a second input end directly connected to the fourth connection terminal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ori Nadav whose telephone number is 571-272-1660. The examiner can normally be reached between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

O.N.
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